

Feb. 15, 1938.

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2,108,328

AUTOMATIC OPERATOR FOR CASEMENT WINDOWS AND THE LIKE

Filed Oct. 4, 1935

2 Sheets-Sheet 1

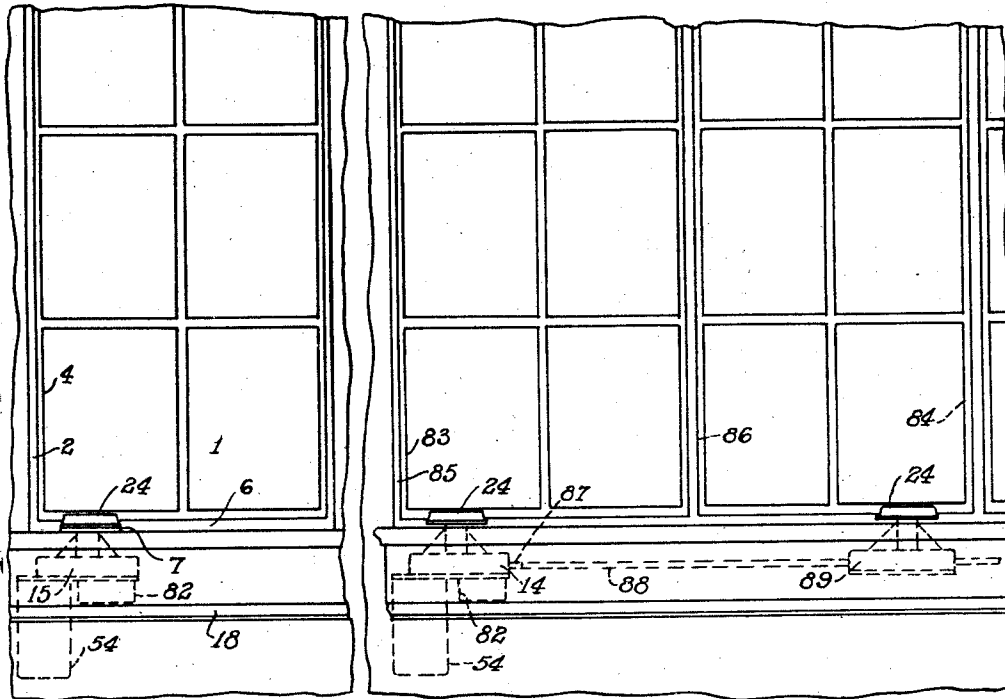


Fig. 1.

Fig. 2.

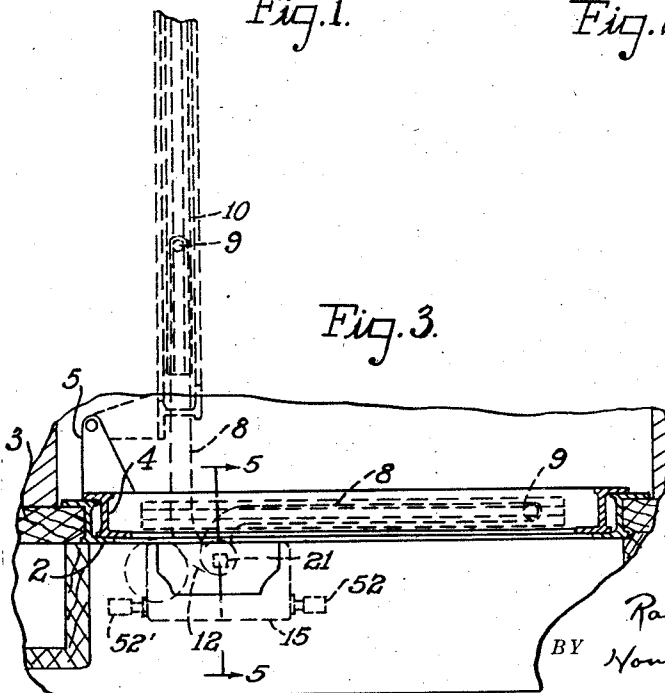


Fig. 3.

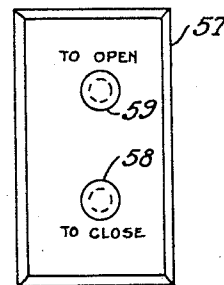


Fig. 4.

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2 Sheets-Sheet 2

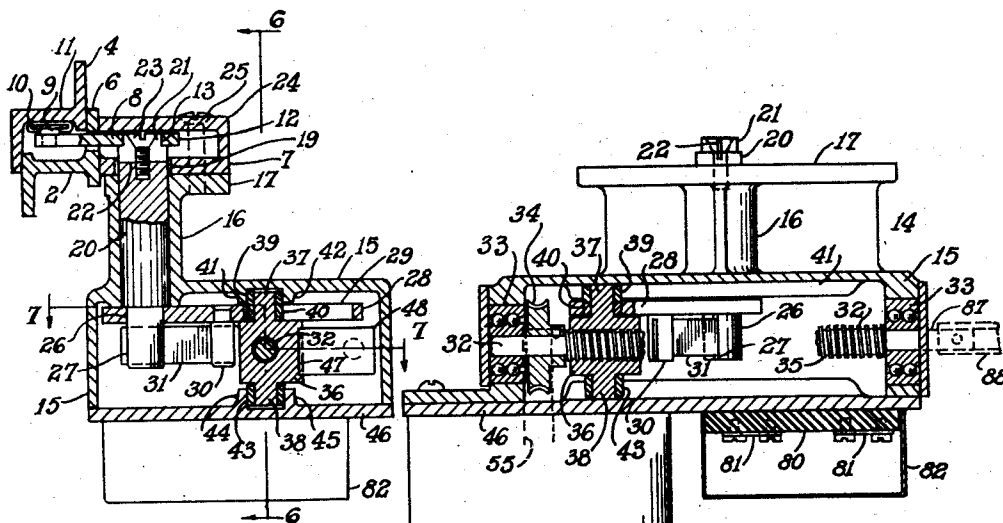


Fig. 5.

Fig. 6.

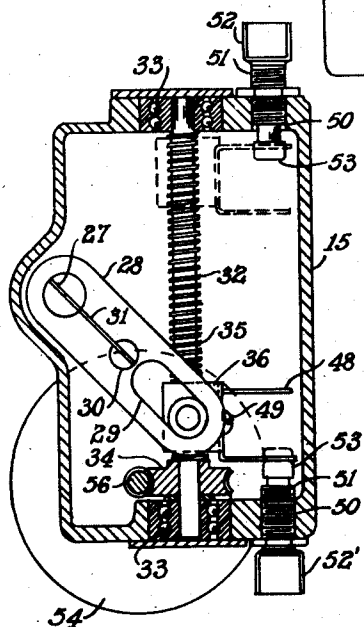


Fig. 7.

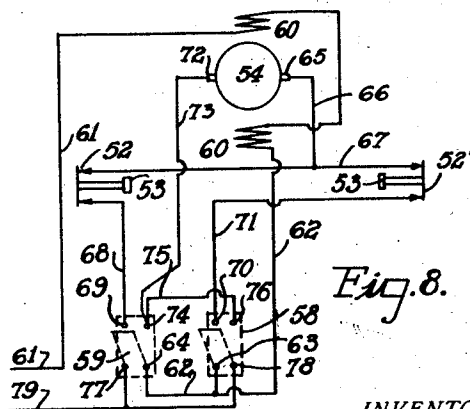


Fig. 8.

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UNITED STATES PATENT OFFICE

2,108,328

AUTOMATIC OPERATOR FOR CASEMENT
WINDOWS AND THE LIKERalph W. Carnahan, near Dayton, Ohio, assignor
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pany, Dayton, Ohio, a corporation of Ohio

Application October 4, 1935, Serial No. 43,534

2 Claims. (Cl. 268—19)

This invention relates to new and useful im-
provements in automatic operators for casement
windows and the like.

It is one of the principal objects of my inven-
tion to provide a simple, compact and efficient
automatic means for opening and closing a case-
ment window or door, or a bank of windows or
doors by remote control.

It is another important object of my invention
to provide an automatic means for opening and
closing a casement window that will permit the
partial opening or closing of the window, or the
reversal of its direction of travel at any time.

It is still another important object of my in-
vention to provide automatic means incorporated
in the operator, to stop the operator mechanism
when the window is either fully opened or fully
closed.

Another important object of my invention is
the incorporation of means within the operator
to hold the window closed under pressure, to pre-
vent its being opened by an intruder or by the
action of the wind.

Other important objects of my invention will
be brought out in the following specification and
the claims annexed thereto.

In the accompanying drawings illustrating my
invention, Figure 1 is an inside view of a single
casement window, showing my automatic oper-
ator connected thereto beneath the window stool.
Figure 2 is a similar view, showing my automatic
operator connected to a pair of casement win-
dows. Figure 3 is a cross-sectional view through
the window shown in Figure 1, showing the win-
dow in the open position in dotted lines. Fig-
ure 4 is a face view of the remote control
switch. Figure 5 is a cross-sectional view through
the operator, taken on the line 5—5 in Figure 3.
Figure 6 is a longitudinal sectional view through
the operator and taken on the line 6—6 in Fig-
ure 5. Figure 7 is a sectional view of the op-
erator, taken on the line 7—7 of Figure 5. And
Figure 8 is a circuit diagram of the electrical cir-
cuits employed.

Referring to the accompanying drawings for
a detailed description of my invention, the num-
eral 1 designates a conventional outswinging
casement window. The window consists of a sta-
tionary frame 2 mounted in the wall construc-
tion 3 in a conventional manner. A hinged sash
4 is attached to the frame 2 by hinges 5—5 at
its upper and lower corners, one of which is shown
in Figure 3.

Welded to the inner face of the sill member
6 of the frame 2, and adjacent the hinged side

of the sash, is a bracket 7. Above the bracket 7,
the sill member 6 is slotted to receive an oper-
ator arm 8. (See Figures 1, 3 and 5.)

The operator arm 8 projects outwardly through
the slotted sill and has attached to its outer end
a shoe 9 that is slidably received in an inverted
channel member 10 secured to the underside of
the bottom rail 11 of the hinged sash 4. At its
inner end the operator arm 8 is formed with an
enlarged offset portion 12 having therein a square
aperture 13. (See Figures 3 and 5.)

My operator 14 as shown in Figures 5, 6 and 7,
is contained in a shallow rectangular case 15
having projecting from its top surface a ribbed
boss 16 that terminates in a flat mounting plate
17 which is joined by the ribs of the boss 16, with
the case 15.

The boss 16 is adapted to pass through the
conventional window stool with the operator 14
positioned beneath it and within the wall con-
struction. A conventional window apron 18 is
shown, and this may be removed to effect adjust-
ments and minor repairs of the operator. The
mounting plate 17 is fitted against the lower face
of the bracket 7, which is provided with a central
aperture 19 to receive therethrough the upper
end of a vertical operator shaft 20. This shaft
is formed at its extreme upper end with a square
shoulder 21 to receive the inner end of the op-
erator arm 8.

In order to effect a tight connection between
the arm 8 and the shaft 20, I have provided the
upper end of the shaft with a transverse axial
slot 22, and the end of the shaft with a counter-
sunk tapped hole to receive a flat head machine
screw 23.

When the operator 14 is positioned against the
bracket 7, the shaft 20 will project above it to
receive upon its square shoulder 21 the arm 8;
and when the screw 23 is tightened the upper
end of the shaft 20 will be sufficiently spread to
secure the arm in place. I have provided a cover
24 adapted to fit over the arm 8 and shaft 20,
and having holes extending therethrough to re-
ceive screws 25 which pass through the bracket
7 and are received in threaded holes in the
mounting plate 17 and by means of which the
operator is supported beneath the bracket 7.

My operator mechanism will now be described.
The shaft 20 projects downwardly through the
boss 16 in which it is journaled, and within the
case 15 the lower end of the shaft is provided
with a shoulder 26. This shoulder is formed with
a transverse slot 27 positioned 45 degrees out of

alignment with the parallel faces of the square shoulder 21 on the opposite end of the shaft.

Freely mounted upon the shoulder 26 against the inner face of the case 15 is a drive arm 28, having in its outer end an elongated slot 29, and at its mean point, between its outer end and the shoulder 28, a downwardly projecting slotted stud 30, securely riveted to the arm 28. The slot within the stud 30 is aligned with the center line of the arm 28 and receives a heavy flat spring 31 whose opposite end is secured in the slot 27 after the arm 28 is placed upon the shaft. The spring 31 forms the sole driving connection between the shaft and the arm. The function of this spring will be hereinafter more fully described.

Projecting longitudinally of the case 15 is a horizontal shaft 32 at right angles with the vertical shaft 20, and journaled in bearings 33, 33 supported in the ends of the housing. On one end of the shaft 32 I have secured a worm gear 34, and between the latter and the opposite end of the case the shaft 32 is formed with a fine pitch square thread 35.

Longitudinally movable along the shaft 32 is a square, internally threaded drive block 36. Projecting from the top and bottom faces of the block 36 are axial extensions 37 and 38. Freely mounted upon the top axial extension are two rollers 39 and 40, the topmost roller 39 being received between parallel ribs 41 and 42 provided on the inner face of the top of the case 15 and extending longitudinally thereof above the shaft 32. The lower roller 40 is received within the elongated slot 29 of the arm 28 to reduce friction and wear between these parts.

Upon the lower axial extension 38 of the block 36 there is freely mounted a single roller 43 that is received between parallel ribs 44, 45 formed on the inner face of a cover plate 46 for the case 15. It is the function of the rollers 39 and 43 and their respective ribs 41, 42 and 44, 45 to resist torsional effects on the square block 36 when the shaft 32 is rotated.

The outer face of the block 36, opposite the shaft 20, is formed with a wide recess 47 to receive a U shaped spring 48 attached to the former by a screw 49 in the block.

The ends of the case 15 are provided with threaded holes 50 to receive the threaded shank extensions 51 of conventional commercial plunger type, quick make and break, single pole switches 52 and 52'. The plunger 53 of each of the switches 52 and 52' projects beyond the inner end of its respective shank extension 51, and is spring tensioned to normally hold the plunger 53 in the outward position with the circuit through the switch closed.

The plunger 53 of each one of the switches 52 and 52' is within the path of the U shaped spring 48 when it is moved longitudinally of the case with the block 36; and when the spring 48 approaches the end of its travel, the adjacent leg thereof will contact the plunger 53 of the switch in that end of the case. When the plunger 53 is forced in sufficiently, the circuit through that switch will be opened; and, when the rotation of the shaft 32 is reversed, to move the spring 48 and block 36 toward the opposite end of the case, the spring-tensioned plunger will move out to again close the circuit through that switch. The electrical functions of these switches will be hereinafter described.

The cover plate 46 is adapted to completely close the case 15 to retain the necessary lubricant therein; and in addition, it has secured to

its lower face a series wound commutating motor 54 whose armature shaft 55 projects through the plate 46 into the case 15. Upon the end of the shaft 55 I have provided a worm thread 56 that meshes with the worm gear 34, and by which the shaft 32 is rotated.

My remote control means comprises a conventional switch cover plate 57 having spaced apertures therein to receive the shank ends of two double pole, single throw switches 58 and 59. These switches are of a conventional type, having a single spring-tensioned plunger which, when depressed, will close the circuit and, when released, will automatically open the circuit. These switches are of the quick make and break type to minimize arcing, and are known to the trade as "momentary contact switches". Adjacent the plunger for the switch 58 I have provided the letters "To close"; and adjacent the switch 59 the lettering "To open".

The electrical circuits employed will now be described with reference to Figure 8. One side of the field 60 is connected through a lead 61 with a source of current, preferably 110 volts, and either alternating or direct. The opposite side of the field 60 is connected, through a lead 62, to one of the poles 63 of the switch 58, and one of the poles 64 of the switch 59.

One brush 65 is connected through a lead 66 to a common lead 67 interconnecting one side of the switches 52 and 52'. The opposite side of the switch 52 is connected by a lead 68 with a terminal 69 of the switch 59, and the opposite side of the other switch 52' is connected with a terminal 70 of the switch 58 by a lead 71.

The opposite brush 72 is connected through a lead 73 with a terminal 74 of the switch 59, and this terminal 74 is also connected by a short lead 75 with a terminal 76 of the switch 58. The remaining terminal 77 of the switch 59, and the terminal 78 of the switch 58, are inter-connected by a lead 79 and with the opposite side of the source of current.

Before describing the functioning of the electrical circuits, it will be repeated here that switches 52 and 52' are normally closed and switches 58 and 59 are of the momentary contact type, being closed only as long as their respective buttons are manually depressed. They will be assumed to be open. When the switch 59 is closed by depressing the button adjacent the lettering marked "To open", current will flow through the lead 61, the field 60, and lead 62 to the terminal 64, through the switch to terminal 74, lead 73 to the brush 72, thence through the armature to the brush 65.

From the brush 65 the current flows through the lead 66 to the common lead 67 inter-connecting the switches 52 and 52'. Now, since the window is closed, the arm 28 will be in the position shown in Figure 7 and the switch 52', with which the spring 48 is in contact, will be "open". Current will then flow through the opposite switch 52 and the lead 68 to the terminal 69 of the switch 59, then through the switch to the terminal 77, and then through the lead 79 to the source of current.

The motor will now rotate the shaft 32 to move the block 36 away from its full-line position shown in Figure 7, toward the opposite end of the case. As long as the switch plunger 59 is held in to close this switch, the window will continue to move toward the open position. When the window is fully opened the spring 48 will contact the opposite switch plunger 53 of the

switch 52, and when this switch is opened the circuit previously described through the switch 59 will be opened and the motor will stop.

When it is desired to close the window the switch 58 is closed by pressing its plunger in. The current will again flow through the lead 61, field 60 and lead 62 to the terminal 63, through the switch to the terminal 70 and lead 71 to the switch 52'. From the switch 52' current will flow through the lead 67 and lead 66 to the brush 65, and thence through the armature to the brush 72. From the brush 72 current will flow through the lead 73 to the terminal 74 and short lead 75 to the terminal 76, and thence through the switch to the terminal 78 and lead 79 to the source of current. The direction of rotation will be reversed and the block 36 will move back to its starting position as shown in Figure 7.

Before the circuit is broken by the opening of the switch 52', the window will be fully closed, and the continued rotation of the motor until the switch 52' is opened will flex the spring 31 to place the closed window under spring tension.

A further useful function of the spring 31 is that when the window starts to open a heavy initial load is not placed on the motor, and in the case of a window sticking a gradually increasing pressure is applied until the window starts to open under the increased spring pressure thus built up.

For the purpose of facilitating the connections between the internal and external or remote electrical circuits, I have provided a terminal block 80 secured to the lower face of the cover 46 having terminal connectors 81 thereon and provided with a suitable cover 82.

Referring now to Figure 2, I have shown a pair of oppositely-hinged casement windows 83 and 84 within a single frame 85 and having the customary mullion 86.

In the case of the window 83 I have shown an operator as described above, but having a short extension 87 for the shaft 32 as illustrated in dotted lines in Figure 6. To this shaft extension there is attached a tubular shaft 88, which projects transversely of the window, beneath the window stool, to a similar operator 89 for the window 84. The operator 89 is in many respects

like the operator 14, except that all switches and the motor are eliminated.

In order that the two windows 83 and 84 may open simultaneously, the shaft 32 for the operator 14 will have a right-hand thread and the shaft for the operator 89 will have an opposite or left hand thread.

This same procedure may be used to connect a series of windows such as a monitor sash, studio window groups, or other inaccessible windows where it is desired to simultaneously open or close more than one unit. It is equally applicable to a door or a series of doors.

When the block 36 is intermediate its two extreme positions and both of the switches 52 and 52' are closed, the window may be moved in either direction by pushing the desired switch button 58 or 59, to cause the motor to rotate in reverse directions to either open or close the window.

Having described my invention, I claim:

1. The combination with a stationary frame, a casement hingedly mounted therein for a swinging movement, a guide, a member movable along said guide, electrical means for shifting said member along said guide, an arm secured to said casement, a shaft for rotating said arm, a second arm loosely secured at one end to said shaft and connected at its other end to said movable member for actuation by the latter, a projection on the second arm, and a flat spring secured at one end to said projection and at its other end to said shaft to provide a yielding connection between the movable member and the casement.
2. The combination with a stationary frame, a casement hingedly mounted therein for a swinging movement, an operator arm attached to said casement, a shallow case attached to said frame, a shaft for turning said arm projecting into said case, a screw shaft mounted in said case, a motor secured to said case for rotating said screw shaft, an internally threaded drive block on said screw shaft within the case, for longitudinal movement in either direction within the latter, and a flat spring connection between the drive block and the first shaft within said case.

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